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HOW TO BECOME AN ENGINEER

BY EARL LEWIS.

Lewis Earl Johnheimer.



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THIS booklet has been published with the purpose of dispelling the haze which seems to surround the qualifications, duties, and general salaries of the engineering professions. If it should be the means of placing a few on the right track and a great many off the wrong track, it will have fulfilled its mission.

Experience proves that a great many young men prepare for the engineering professions who have no engineering ability, and who would do better in some other line. The fact that a boy displays an interest in the working of machinery or in the operation of a dynamo does not indicate that he is destined to become an engineer. If the same boy, however, has shown himself apt at mathematics, and is interested in general science, he may safely take up one of the engineering professions, and with hard work will achieve success.

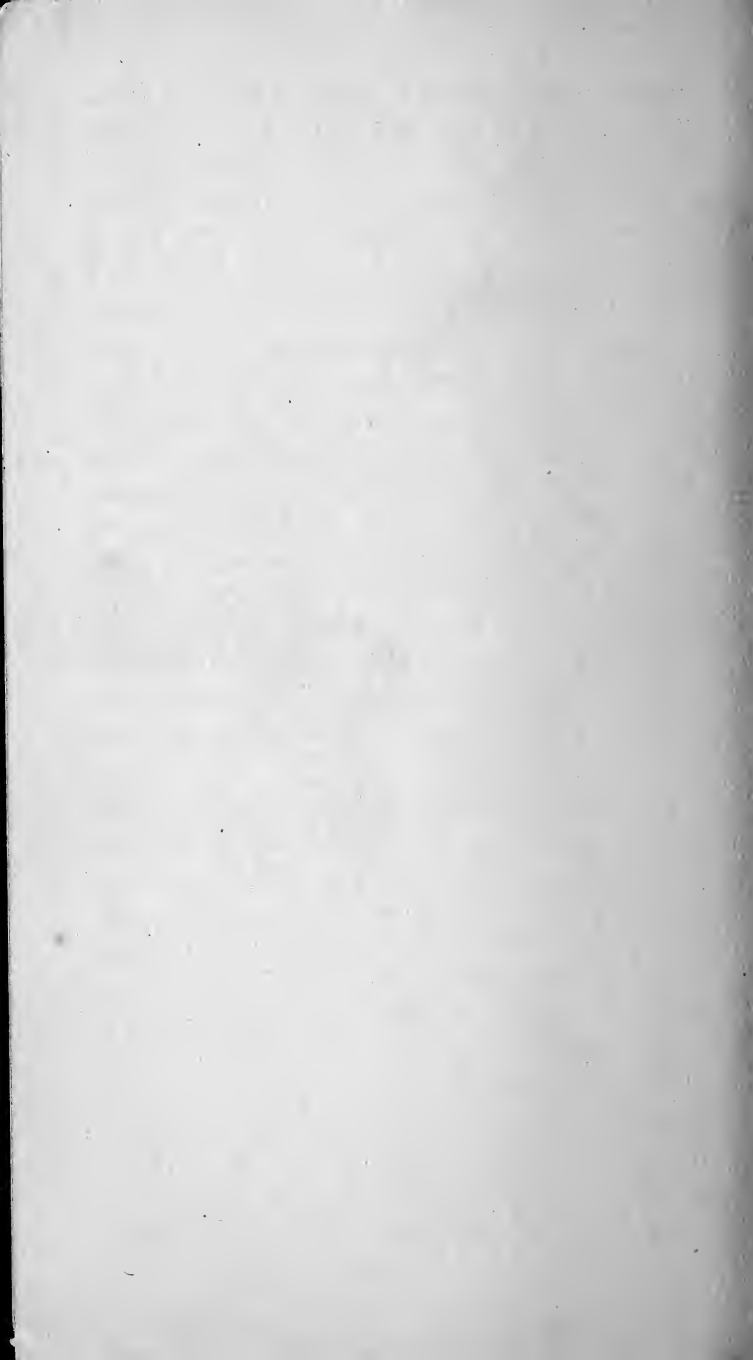
The first clew to engineering ability is aptness at mathematics. The foundation of engineering is mathematics, and he who has no ability in this subject will never make a success as an expert engineer.

A great many young men go to hear popular lectures on Electrical Engineering or Chemistry, see some flashy experiments per-

formed on the "Wizard Herrman" plan and go home with the idea that engineering is the only profession that appeals to them. Others read advertisements in the papers of Correspondence Schools, which declare solemnly that any young man who will employ his evenings studying as they direct for a few months or longer, will be qualified for the position of Electrical or Mechanical Engineer at a salary of about \$1,200.00 to begin, etc., etc. That a great many of these young men are ignorant of what the profession is can be verified by the fact that in New York the second-hand book stores are stocked with the reference libraries of the Engineering Courses of these schools, which were undoubtedly disposed of by inefficient students.

Another error which a great many young men make is to imagine that because they are going to take up a technical study they do not require any general culture. They do not look into the fact that an engineer is a man in charge of other men, that one of his main duties is to prepare reports on the operation of machines or the situation of docks, etc., and all this requires a good general education. In order to lead other men one must command their respect, and this can only be done by showing superiority in every way.

In regard to the best method of preparing for and getting into the profession, it must be borne in mind that no man can expect to



obtain any situation of responsibility in these lines who has not had practical experience in field work for Civil Engineering, or in handling dynamos or machinery for Electrical or Mechanical Engineering. To quote from an article written by one of the best known Mechanical Engineers in the country:

"There is no royal road to the position of Mechanical or Electrical Engineer. One must start at the very bottom and work his way up, and this means work, plenty of hard work and dirty work. After one has mastered the practical side of the profession theory can come later. But no man can expect to direct other men to do things which he, himself, is unable to do. Theory without practice is worthless, and expensive machinery is not going to be intrusted to men who merely gained their knowledge from books."

It makes no difference how well a person knows the theory of the subject, there is a wide gap between reading how to connect up a dynamo, by seeing an elaborate drawing and cut of the machine, and actually handling the machine itself. It is all very clear to a person who has had the practical experience, but very obscure to a person who has not had the experience.

The man who, for the first time, handles a switch of an electrical circuit of even 120 or 240 volts is bound to do so in a very gingerly manner, and with an "I don't know



what is going to happen next" look, which is hardly calculated to inspire his superior with confidence in him.

Young men would do well to pause and consider these facts before entering upon a purely theoretical course of instruction.

As regards to whether practice should precede or follow theory, this is a difficult matter to decide. The consensus of opinion of engineers is that both should go hand in hand, but it must be taken into consideration that the practice a student gets at the universities is not the same as the practice in real engineering. The student will not realize this until he leaves the college and takes up actual work, where there may be no solutions to the problems given, and where no learned professor is on hand to tide one over the difficult passages to an ultimate solution.

The author's opinion is that it is better for a student, after leaving high school, where a good training has been received in mathematics and general science, to take up actual work in a machine shop, electrical works, or in field work, and then, after a few years' hard work complete his theoretical course. He will then know what parts of his studies to pay the most attention to, will realize how little he knows, and will be continually alert to know the reasons for the various things he has observed in his



practical work. Practice makes a man hungry to learn the "whyness" of things.

The various night schools of engineering in the country are working on this method. During the day a man works at the practical part of the profession; at night he attends the school and learns the theory, and he accomplishes more in the two hours spent in the night school than a great many students studying six hours a day who have not his enthusiasm, and to whom the study has become routine work.

In regard to the salaries paid Engineers, these vary so much that it is difficult to obtain authentic information on the subject.

A Mechanical Engineer of experience receives, as an average, from \$150.00 to \$250.00 per month.

The average salary of the Electrical Engineer falls below this, and they average from \$125.00 to \$200.00 per month.

Civil Engineers, when in the employ of the City or State, are, as a general rule, paid better and have shorter hours than either Mechanical or Electrical Engineers in the employ of corporations.

In regard to men employed in Power Stations, the following wages are paid:

Oilers receive as an average \$1.50 to \$1.75 per day for a working day of eight hours, but the work is hard and a little dangerous, as their duty is to feel the different parts of the machine while running, to ascertain

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whether the parts are becoming hot, and to keep the machines at all times well lubricated.

Dynamo Cleaners receive about the same pay as Oilers.

Dynamo Tenders average \$2.25 per day, but the position will only be intrusted to those who have had experience in handling the machines.

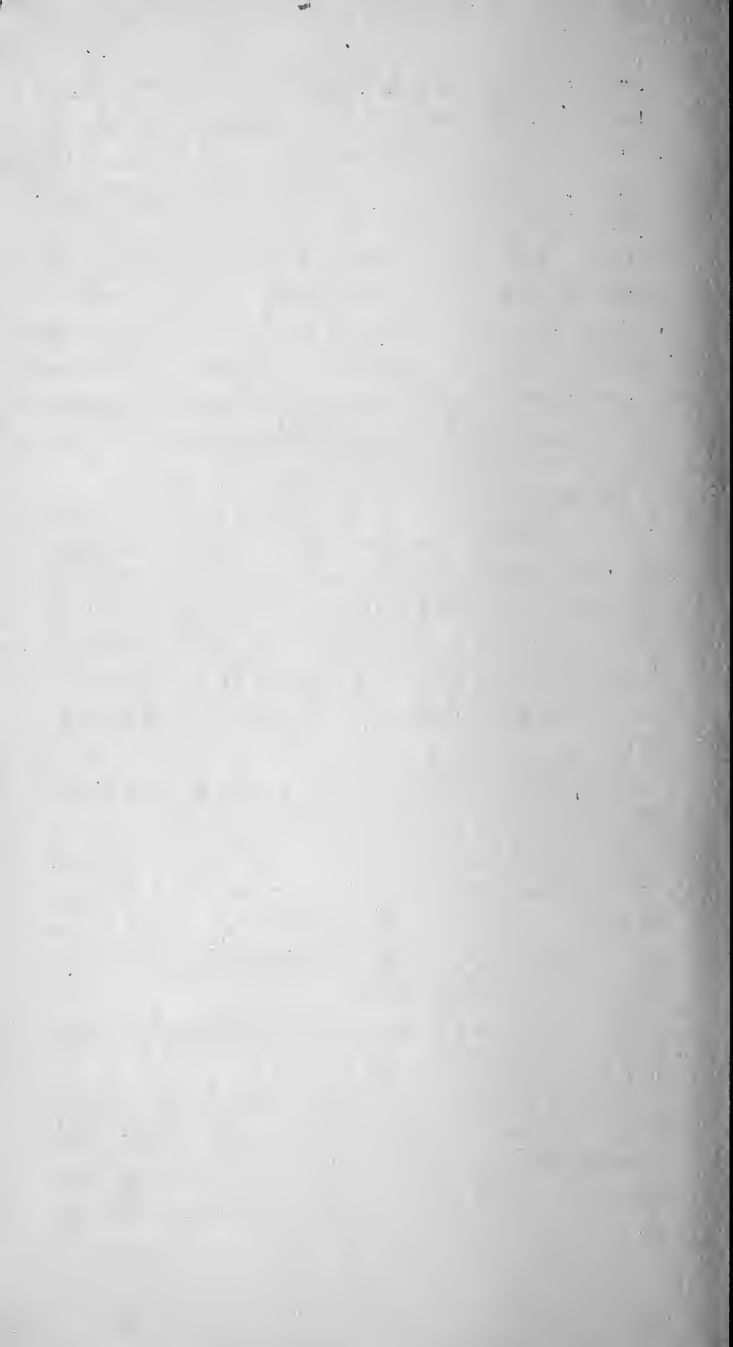
Switchboard men are paid from \$2.50 to \$3.50 per day, according to their experience.

Foremen of the sub-stations of the Power Houses average \$100.00 per month.

Draughtsmen in the different engineering lines are paid from \$12.00 to \$35.00 or more per week. To a man who is apt at figures, and can do neat and accurate work with good lettering, the position pays quite well at the start, and the work is cleaner and easier than starting from the practical side. There is the disadvantage, however, that there is no opportunity for practical engineering work and consequently the advancement is slower.

Bridge Draughtsmen receive a salary of from \$1,200.00 to \$1,800.00 per year. Junior Bridge Draughtsmen from \$900.00 to \$1,200.00 per year.

The minor positions in the Civil Engineering line, under City or State employ, pay well—in fact, much better than the mi-



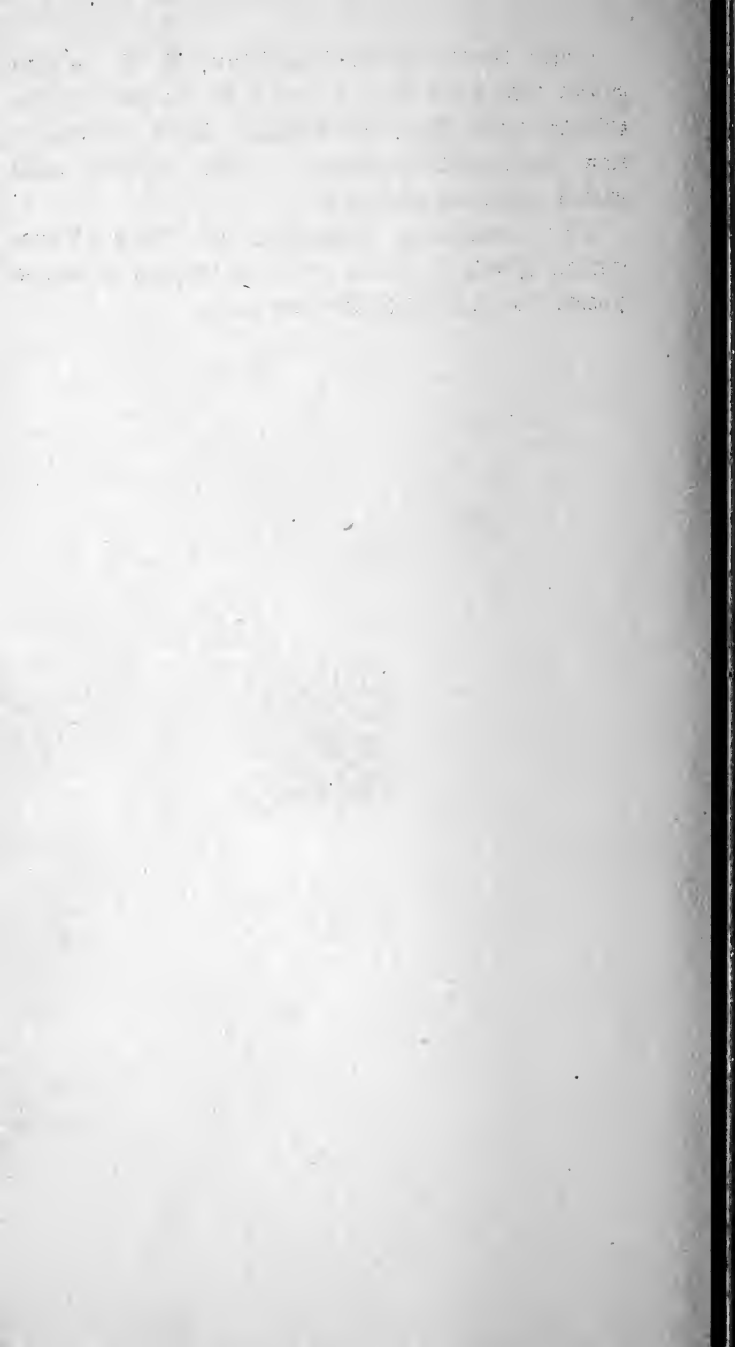
nor positions in the Mechanical or Electrical Engineering lines. The applicants for all City, State or Government positions must pass a Civil Service Examination, and those who have the highest rating get the positions. For the minor positions an examination is given in arithmetic, but it will be found that this subject is not as simple as some students imagine. There are some very catchy questions in practical mensuration given, and an applicant should be well prepared on this subject.

Students who are preparing for Civil Service positions will find it to their advantage to obtain the "Chief," a weekly, published in New York at 53 Park Row, and which is devoted to the Civil Service, and contains from time to time questions from previous examinations and other instructive information.

Regarding Colleges giving courses in Engineering, it is presumed that these are too well known to receive comment here. It may be stated, however, that Cornell, the Massachusetts Institute of Technology and Stevens' Institute are held in high esteem by the engineering profession.

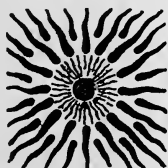
For short courses, the following schools can be recommended:

Cooper Institute of New York City, which gives a five-year course in engineering science in their night school, thus allowing the student to work at the profession during the day.



Pratt Institute, of Brooklyn, N. Y., which gives two-year day courses in Applied Electricity and Machine Design, both of which are excellent courses. This school also gives evening courses.

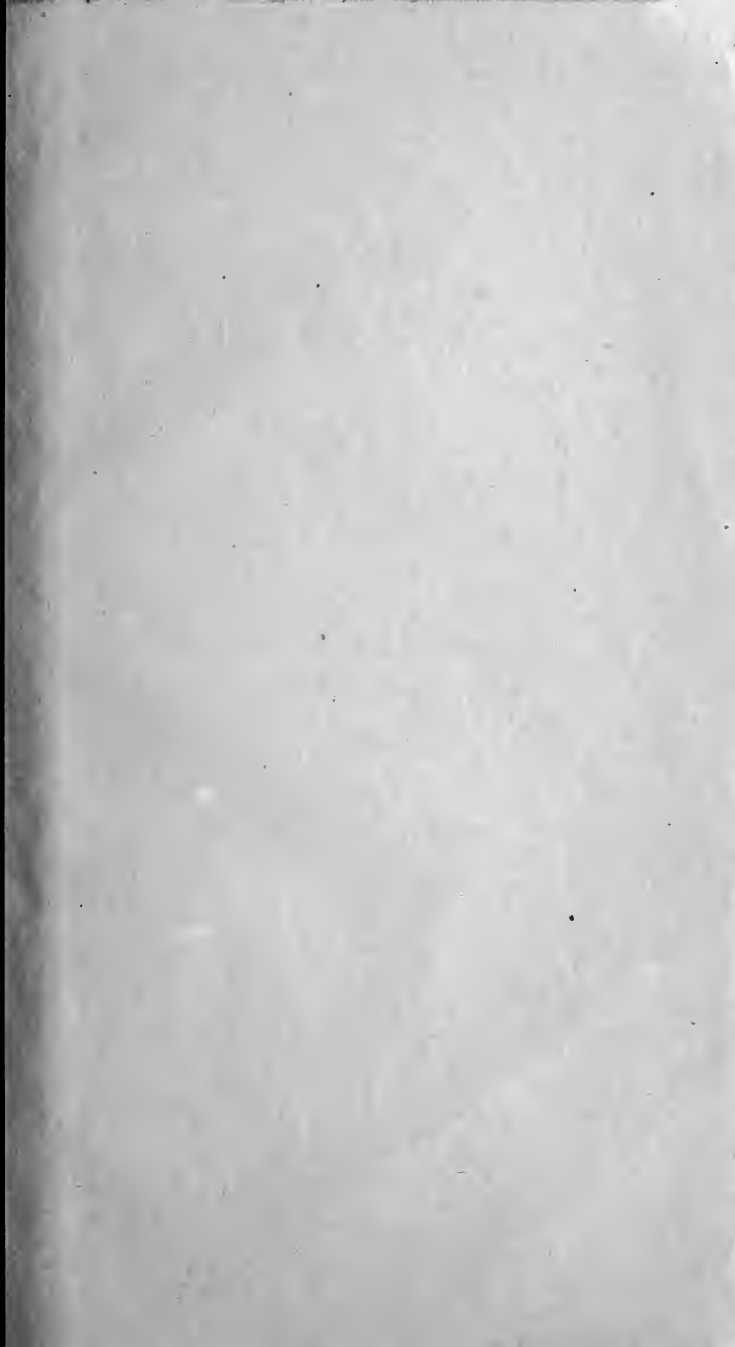
The American Institute, of New York, which gives a short evening course of three years in Applied Electricity.



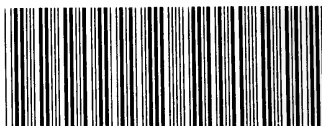
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